UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/824,936	04/03/2001	Jacques Schmitt	H37-091 DIV	9938

21706 7590 05/11/2006

NOTARO AND MICHALOS
100 DUTCH HILL ROAD
SUITE 110
ORANGEBURG, NY 10962-2100

EXAMINER	
CROWELL, ANNA M	
ART UNIT	**PAPER NUMBER**
1763	

DATE MAILED: 05/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/824,936	SCHMITT, JACQUES	
	Examiner	Art Unit	
	Michelle Crowell	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 6-12* is/are pending in the application.

4a) Of the above claim(s) *2 and 9-12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3, 4 and 6-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Status of the Claims

Claims 1-4 and 6-12 are pending. Claims 2 and 9-12 are withdrawn from consideration. Claims 1, 3, 4, and 6-8 are rejected.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 3, 4, and 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanada (Japanese Patent Publication 08-186094) in view of Shang et al. (U.S. 6,177,023) and Collins et al. (U.S. 5,210,466).

Referring to Drawings 1 and 2 and the abstract, Hanada discloses a capacitively coupled radio frequency plasma reactor 19 comprising: at least two electrically conductive electrodes 12 and 21 spaced from each other, each electrode having an external surface, an internal process space 11 enclosed between the electrodes, a gas providing means 16 for providing the internal process space with a reactive gas, at least one radio frequency generator 29 connected to at least one of the electrodes, at a connection location, for generating a plasma discharge in the process space, a means 26 to evacuate the reactive gas from the reactor, at least one substrate 1 defining one limit of the internal process space, to be exposed to the processing action of the plasma discharge, the at least one substrate extends along a general surface and is arranged between the electrodes, at least one dielectric layer 21a has at least one non planar-shaped external surface

(Fig. 2 and abstract) extending outside the internal process space, the dielectric layer being a capacitor that is electrically in series with the substrate and the plasma, and the dielectric layer having a capacitance per unit surface values which are not uniform along at least one direction of the general surface, for generating a given distribution profile, especially for compensating a process non uniformity in the reactor.

Hanada fails to teach a radio frequency generator for frequencies greater than 13.56 MHz and at least one substrate with a largest dimension of at least 0.7m.

Referring to column 4, lines 26-47, Collins et al. discloses a capacitively coupled radio frequency plasma reactor using a radio frequency generator which applies frequencies greater than 13.56 MHz (50-800 MHz) since higher frequencies provide commercially viable processing rates and substantial reduction in sheath voltages. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for the radio frequency generator of Hanada to apply frequencies greater than 13.56 MHz as taught by Collins et al. since higher frequencies provide commercially viable processing rates and substantial reduction in sheath voltages.

Referring to column 5, lines 58-63, Shang et al. teaches a plasma reactor for processing a substrate for flat panel displays with a largest dimension up to 1m. It is well known in the art to scale up or down an apparatus to accommodate the desired substrate size. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the apparatus of Hanada with a substrate having a largest dimension up to 1m in order to process substrates for flat panel displays and furthermore since it is well known in the art to scale up or down an apparatus to accommodate the desired substrate size and. Additionally, where the only difference between the prior art and the claims was a recitation of relative dimensions of the

claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device (In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984)).

With respect to the "internal process space having a size to normally form a standing wave spacial oscillation therein", it should be noted that the combination of Hanada, Shang, and Collins teaches a structure of a large-sized reactor operating at above 13.56 MHz and processing a large substrate with a dimension larger than 0.7 m. In addition, while features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function (In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429,1431-32 (Fed. Cir. 1997)). In the instant case and stated above, the apparatus of Hanada, Shang, Sato, and Collins teaches the structural limitations, thus it is inherent that at high frequencies above 13.56 MHz and a large reactor sized to accommodate a 1 m substrate, standing wave oscillations will occur between the chamber walls.

With respect to claim 3, the dielectric layer 21a has a thickness "a" along a direction perpendicular to the general surface of the substrate 1, the thickness being non uniform along the dielectric layer, so that the reactor has a location-dependent capacitance per unit surface values along the general surface (Fig. 2 and abstract).

With respect to claim 4, the dielectric layer 21a is the thickest in front of the location in the process space 11 which is the furthest away from the connection location where the radio frequency generator 29 is connected to the at least one electrode and the thickness decreases

from the process space location as the distance between the process space location and the connection location on the corresponding electrode decreases (Fig. 1 and abstract).

With respect to claim 6, at least one of the electrodes 21 has a non planar-shaped surface facing the substrate 1 (Figs. 1 and 2).

With respect to claim 7, the dielectric layer 21a is locally delimited by a surface of one of the electrodes 21, and the delimitation surface of the one electrode is curved (Fig. 1 and 2).

With respect to claim 8, the dielectric layer comprises a solid dielectric layer (Figs. 1, 2 and abstract).

3. Claims 1, 3, 4, and 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanada (Japanese Patent Publication 08-186094) in view of Shang et al. (U.S. 6,177,023) and Sato et al. (6,199,505)

Referring to Drawings 1 and 2 and the abstract, Hanada discloses a capacitively coupled radio frequency plasma reactor 19 comprising: at least two electrically conductive electrodes 12 and 21 spaced from each other, each electrode having an external surface, an internal process space 11 enclosed between the electrodes, a gas providing means 16 for providing the internal process space with a reactive gas, at least one radio frequency generator 29 connected to at least one of the electrodes, at a connection location, for generating a plasma discharge in the process space, a means 26 to evacuate the reactive gas from the reactor, at least one substrate 1 defining one limit of the internal process space, to be exposed to the processing action of the plasma discharge, the at least one substrate extends along a general surface and is arranged between the electrodes, at least one dielectric layer 21a has at least one non planar-shaped external surface (Fig. 2 and abstract) extending outside the internal process space, the dielectric layer being a

capacitor that is electrically in series with the substrate and the plasma, and the dielectric layer having a capacitance per unit surface values which are not uniform along at least one direction of the general surface, for generating a given distribution profile, especially for compensating a process non uniformity in the reactor.

Hanada fails to teach a radio frequency generator for frequencies greater than 13.56 MHz and at least one substrate with a largest dimension of at least 0.7m.

Referring to column 2, lines 37-65, column 4, line 40-column 5, line 40, Sato et al. discloses a capacitively coupled radio frequency plasma reactor designed to use a radio frequency generator which applies frequencies greater than 13.56 MHz (30-300 MHz) (col. 2, lines 53-56) and that processes a substrate with a largest dimension of at least 0.7m (1 m) (col. 2, lines 37-44) since it is important to uniformly process large substrates at high frequencies with a reduced weight, dimension, and cost to the overall apparatus. Additionally, higher frequencies provide commercially viable processing rates and substantial reduction in sheath voltages and larger substrates yield increased product throughput. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to design the reactor of Hanada to apply frequencies greater than 13.56 MHz and accommodate at least one substrate with a largest dimension of at least 0.7m. as taught by Sato et al. since there is a growing demand in industry to uniformly process large substrates at high frequencies with a reduced weight, dimension, and cost to the overall apparatus. Additionally, higher frequencies provide commercially viable processing rates and substantial reduction in sheath voltages and larger substrates yield increased product throughput.

Moreover, referring to column 5, lines 58-63, Shang et al. teaches a plasma reactor for processing a substrate for flat panel displays with a largest dimension up to 1m. It is well known in the art to scale up or down an apparatus to accommodate the desired substrate size. Additionally, it is well known in the art to scale up/down the power in order to accommodate the desired substrate size (col. 6, lines 58-60). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the apparatus of Hanada with a substrate having a largest dimension up to 1m with appropriate power level in order to process substrates for flat panel displays and furthermore since it is well known in the art to scale up or down an apparatus to accommodate the desired substrate size. Additionally, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device (In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984)).

With respect to the "internal process space having a size to normally form a standing wave spacial oscillation therein", it should be noted that the combination of Hanada, Shang, and Sato teaches a structure of a large-sized reactor operating at above 13.56 MHz and processing a large substrate with a dimension larger than 0.7 m. In addition, while features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function (In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429,1431-32 (Fed. Cir. 1997)). In the instant case and stated above, the apparatus of Hanada, Shang, Sato, and Collins teaches the structural limitations, thus

it is inherent that at high frequencies above 13.56 MHz and a large reactor sized to accommodate a 1 m substrate, standing wave oscillations will occur between the chamber walls.

With respect to claim 3, the dielectric layer 21a has a thickness "a" along a direction perpendicular to the general surface of the substrate 1, the thickness being non uniform along the dielectric layer, so that the reactor has a location-dependent capacitance per unit surface values along the general surface (Fig. 2 and abstract).

With respect to claim 4, the dielectric layer 21a is the thickest in front of the location in the process space 11 which is the furthest away from the connection location where the radio frequency generator 29 is connected to the at least one electrode and the thickness decreases from the process space location as the distance between the process space location and the connection location on the corresponding electrode decreases (Fig. 1 and abstract).

With respect to claim 6, at least one of the electrodes 21 has a non planar-shaped surface facing the substrate 1 (Figs. 1 and 2).

With respect to claim 7, the dielectric layer 21a is locally delimited by a surface of one of the electrodes 21, and the delimitation surface of the one electrode is curved (Fig. 1 and 2).

With respect to claim 8, the dielectric layer comprises a solid dielectric layer (Figs. 1, 2 and abstract).

Response to Arguments

4. Applicant's arguments filed February 28, 2006 have been fully considered but they are not persuasive.

5. Applicant has argued that why would the person of ordinary skill in the art also believe that forming the claimed capacitance profile and operating at higher frequency would also work? The claimed capacitance profile is disclosed in the primary reference (Hanada), thus a motivation to have the claimed capacitance profile is not necessary. Thus, a secondary reference (Collins et al.) was applied to teach that operating at higher frequencies enhances processing rates. Therefore, the teachings of Hanada '094 in view of Collins et al. '466 and Shang et al. '023 satisfy the claimed requirements.

6. Applicant has argued that why would the skilled artisan think that scaling Hanada's reactor up and operating it a different frequency would work? As supported by Shang et al. (col. 6, lines 58-57), the skilled artisan knows that when you scale up the reactor, the frequency would scale up also in order to effectively process a large substrate. Additionally, in column 2, lines 31-34, Sato et al. teaches it is conventionally known to scale up an apparatus in order to accommodate a larger substrate. Thus, to process a larger substrate in the apparatus of Hanada, it is obvious to scale the apparatus of Hanada based on the teachings of Shang et al. Therefore, the teachings of Hanada '094 in view of Collins et al. '466 and Shang et al. '023 satisfy the claimed requirements.

With respect to the declaration

7. Inventor has argued that it is physically impossible that standing wave effects can occur in an RF plasma reactor of Hanada. It should be noted that it is not required under a 35 U.S.C. 103(a) rejection to have a motivation for using the primary reference (Hanada). Additionally, the

requirement of apparatus claims simply means that the prior art must teach the claimed structure and does not necessarily have to address the problem (standing wave effect) and solution presented in the current invention; however, the prior art of Hanada, Shang, Sato, and Collins teaches that the shape of the dielectric layer 21a and lower electrode 21b (Hanada) promotes plasma uniformity and thus would compensate for non-uniformity due to the standing wave effect that will occur when operating at higher frequencies or processing larger substrates. Therefore, the apparatus of Hanada, Shang, Sato, and Collins satisfies the claimed requirements.

8. Inventor has argued that Collins teaches the use of higher frequencies but also includes a proposal to compensate losses due to standing wave effects; however, as stated before, the requirement of apparatus claims simply means that the prior art must teach the claimed structure and does not necessarily have to address the problem (standing wave effect) and solution presented in the current invention. Furthermore, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Therefore, the apparatus of Hanada, Shang, Sato, and Collins satisfies the claimed requirements.

9. Inventor has argued that scaling up a reactor will create the problem on non-uniformity, but will not solve it. As stated above, the requirement of apparatus claims simply means that the prior art must teach the claimed structure and does not necessarily have to address the problem (non-uniformity) and solution presented in the current invention; however, the prior art of

Hanada, Shang, Sato, and Collins teaches that the shape of the dielectric layer 21a and lower electrode 21b (Hanada) promotes plasma uniformity and thus would compensate for non-uniformity due to the standing wave effect. Therefore, the apparatus of Hanada, Shang, Sato, and Collins satisfies the claimed requirements.

10. Inventor has argued that Sato does not propose a need for a dielectric layer with at least one non-planar surface. It should be noted that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In the instant case, Hanada et al. discloses the dielectric layer with at least one non-planar surface. Sato et al. was simply applied for the teaching of applying frequencies greater than 13.56 MHz with a substrate having a largest dimension of at least 0.7m. Therefore, the apparatus of Hanada, Shang, Sato, and Collins satisfies the claimed requirements.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Crowell whose telephone number is (571) 272-1432. The examiner can normally be reached on M-F (9:30 -6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Michelle Crowell
Patent Examiner
Art Unit 1763
05-08-06

Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1763